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Use of Discarded Fishing Nets as Near Surface Mounted Reinforcement for Prolonging Lifetime of Existing Structures

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INTRODUCTION

In recent years there has been a growing concern regarding the state of the ocean ecology due to marine litter. The United Nations Environment Programme (UNEP) report of 2009 estimated $6.4 \cdot 10^6$ metric tonnes of ocean litter is discarded into the oceans pro anno. 10% of this is estimated to be discarded fishing nets, thus 640,000 metric tonnes of fishing nets end up as free floating ocean waste annually. Fishing nets are made from plastic fibers, which do not biodegrade, but undergo a physical and chemical degrading process. When the plastic fibers are degraded into micro plastic it can be absorbed in plankton and thereby pollute the entire food chain. It would therefore be beneficial for the environment to find a new use for the discarded fishing nets, thus reducing the growing amount of marine litter. One use for discarded fishing nets could be as different types of reinforcement in concrete.
Due to the big fishing industry in Greenland an alternative use for discarded fishing nets would have a decreasing effect on the amount of marine litter in the Arctic. In this study discarded fishing nets from Sisimiut, Greenland were used for creating fiber-reinforced polymer (FRP) composites for near surface mounted reinforcement (NSMR). NSMR prolongs the lifetime of existing structures, and thus reduces the amount of materials transported to Greenland, reducing CO_2-emission and expenses as well.

RESULTS AND CONCLUSION

Throughout this study a method for casting NSMR FRP bars with discarded fishing nets were developed and beams with NSMR FRP bars were tested and analyzed. The beams with NSMR FRP bars generally attain a higher load compared to a beam without NSMR, and the point of cracking increases. This means cracking of the beam is postponed, and it can further be concluded, from the pattern of visible cracks, that the FRP bars reduce the cracks caused by shear strength. Furthermore there is a tendency that the use of NSMR FRP bars, made from discarded fishing nets, has a decreasing effect on the formation of visible cracks. Thus the use of discarded fishing nets as NSMR FRP bars can propone the point of failure and increase the lifetime for a concrete beam.

This field of study still requires mush further research before it is fully implementable. A chemical analysis and characteristic of the mechanical properties of the fishing nets should be made. Alternative methods can be used for casting FRP bars e.g. the strings of fishing nets could be dipped in epoxy or coating for the purpose of crating larger anchors to increase the sealing effect. Furthermore discarded fishing net could be used as e.g. mesh reinforcement and fiber reinforcement in concrete constructions. The opportunities for using discarded fishing nets as an alternative reinforcement, thus preventing further pollution of the oceans, are defiantly present.